MATH 120 Section 7.2 Sets

Definitions: A set is any collection of objects. Each object in a set is called a member or element of the set. A set without any elements is called the empty or null set. A finite set is a set that has a finite number of elements. An infinite set is a set with an infinite number of elements.

Rule Method vs Listing Method for Sets

Example: 1) Complete the table.

Rule Method	Listing Method	Finite or Infinite?
*{x| x is a weekend day}	{Saturday, Sunday}	
$\{x \mid x^2 = 4\}$		
{x| x is an odd counting number}		

*Read: "The set of x such that x is a weekend day."

Symbols & Notation

$\in$ is an element of

$A \subset B$: Set A is a subset of set B means every element of A is an element of B.

$A = B$: Set A is equal to set B if every element of A is an element of B AND every element of B is an element of A, that is, $A \subset B$ AND $B \subset A$.

$\emptyset = \{\ \}$ is the empty set. Note: The empty set is a subset of every set.

Examples: Let A = {-3, -1, 1, 3}, B = {3, -3, 1, -1}, C = {-3, -2, -1, 0, 1, 2, 3}. Determine if the following are true or false.

2) $3 \in A$	7) $A \subset C$
3) $0 \in A$	8) $C \subset A$
4) $A \subset B$	9) $A \neq C$
5) $B \subset A$	10) $\emptyset \subset A$
6) $A = B$	11) $\emptyset \subset C$
	12) $\emptyset \in A$

Example: 13) List all subsets of the set {a, b, c}.

Universal Set, Intersection & Union

U: The universal set is the set of all elements under consideration.

$A \cap B = \{x | x \in A \; and \; x \in B\}$: A intersect B is a set of all elements in A AND B.

$A \cup B = \{x | x \in A \; or \; x \in B\}$: A union B is a set of all elements in A OR B (or both).

$A' = \{x \notin A\}$: The complement of A is the set of elements in the universal set that are not in A.

Examples: Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9}, A = {3, 6, 9} and B = {3, 4, 5, 6, 7}. Determine the following sets. Write using the listing method.

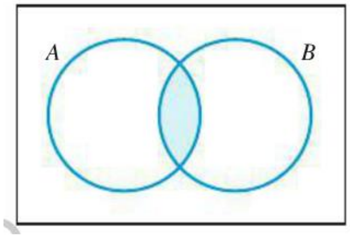
14) A ∩ B

15) A ∪ B

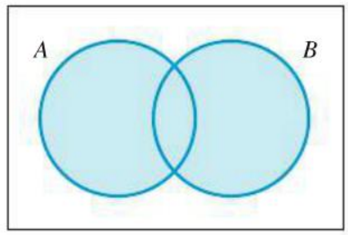
16) A′

17) B′

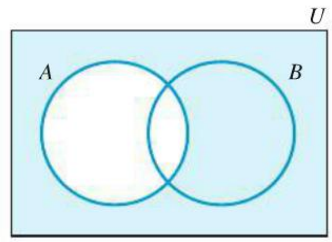
Venn Diagrams



$A \cap B$



$A \cup B$



A'

Examples: Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9}, A = {3, 6, 9} and B = {3, 4, 5, 6, 7}. Draw a Venn diagram and then answer the following:

18) A ∩ B

19) A ∪ B

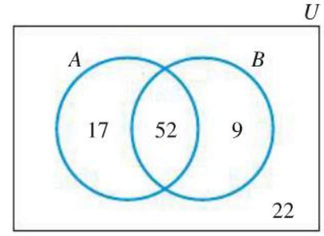
20) A′

21) B′

22) (A ∩ B)′

23) (A ∪ B)′

Examples: Use the Venn Diagram to determine the indicated <u>number of elements</u>.



24) n(U)

25) n(A ∩ B)

26) n(A)

27) n(B)

28) n(A ∪ B)

29) n(A')

30) n(B')

31) A survey was given to 100 randomly chosen students which included the following three questions and responses.

Do you own a TV?	Do you own a car?	Do you own a TV and a car?
75 said yes	45 said yes	35 said yes

Draw a Venn diagram and answer the following questions:

a) How many students do not own a TV?

b) How many students do not own a car?

c) How many students do not own a car or a TV?

d) How many students own a TV but not a car?

e) How many students own a car but not a TV?

f) How many students own either a TV or a car?